NASA Science Mission Directorate - Applied Sciences Program

Invasive Species – Fiscal Year 2005 Annual Report [*]

SUMMARY

The Invasive Species program element works with the U.S. Geological Survey (USGS) to enhance the capabilities of the Invasive Species Forecasting System (ISFS). USGS (through the National Institute for Invasive Species Science (NIISS) in Fort Collins, Colorado) is a primary respondent to invasive species among the federal agencies. In 2005, the National Invasive Species Council (NISC) invited NASA to join the Council in recognition of the collaboration between NASA and USGS on the ISFS. The NISC is an interagency group formed by Presidential Directive in 1999 and provides direction to the NIISS. The contributions of NASA's Applied Sciences Program to the ISFS are the primary activity within the Invasive Species program element.

In FY05, the NASA Invasive Species team and USGS completed a benchmark report describing the impact of NASA Earth science observations and modeling capability on the ISFS. USGS plans for the operational transfer of the NASA ISFS enhancements to USGS, which should be completed in 2007. Through one on-going project and two projects added in 2005, the Invasive Species team plans to work more with the National Park Service (NPS) in the ISFS approach to extend capabilities from NASA observations and models.

MAJOR ACCOMPLISHMENTS

Systems Integration and Visualization of Yellowstone

In FY05, the project team validated use of a new MODIS index of vegetation phrenology and collected a detailed field validation data set (>17,000 point measurements). The project team developed a fluid dynamic model of wind fields of large landscapes, collected an extensive field validation data set based on custom-designed logging anemometers (>1500 logger days), and validated the model against the data set. The project team continued development of a snowpack simulation model and collected an extensive field validation data set to support this (>3000 cores). For these models, the project team delivered custom queries and developed a Yellowstone National Park-specific application of a generic algorithm for modeling species dispersal. The project team also demonstrated visualization products to the NPS interpretation staff.

In FY06, this project will deploy interactive visualization products in Yellowstone National Park visitor education centers. Team members will publish a series of journal papers on snowpack modeling, remote sensing, integration through visualization, and product impacts.

Invasive Species Forecasting System (ISFS)

In FY05, the project team deployed the ISFS Release 2 at USGS and NASA facilities and assisted in the compilation of the FY05 Benchmark report. The team also established the NASA/USGS ISFS Operational Transfer "Tiger Team" Committee and submitted an ISFS Operational Transfer Plan, and it developed an ISFS Client Interview plan and conducted interview sessions. The project team produced comprehensive MODIS Value Add Vegetation Index Summaries and related datasets and integrated these

[*] The FY05-09 Invasive Species Program Element Plan is available through: *http://aiwg.gsfc.nasa.gov/dss.html*

into the USGS/ISDS element of the ISFS. In FY06, the project team will deliver ISFS Releases 3 and 4 and integrate NPS and Yellowstone Environmental Research Center projects into ISFS activities.

Value Added Products from Vegetation and Precipitation Time-Series Data Sets in Support of Invasive Species Prediction

In FY05, the project team completed the first "National Tamarisk Habitat Suitability Map," which is a tool to help land managers predict the extension of tamarisk in the U.S. The project team also derived an ISFS MODIS phenology "National Data Layer," collected field and high-resolution data over intensive tamarisk study areas, and initiated research on agent-based modeling. In FY06, the project team will help develop a high-resolution probability/habitat map of tamarisk at four intensive study sites and will further develop the agent-based modeling.

SOLICITATIONS

Decisions CAN

The Invasive Species Program received 13 Step-1 proposals in the Decisions CAN and encouraged 7 to submit full proposals. In Step-2, the Invasive Species Program received 10 full proposals, including some that overlapped significantly with the Ecological Forecasting program.

Following the panel reviews and internal assessment for programmatic balance, the Applied Sciences Program selected the following Invasive Species proposal for an award:

> Using the Invasive Species Forecasting System to Support National Park Service Decisions on Fire Management Activities and Invasive Plant Species Control
> *PI: Jeffrey Morisette, NASA Goddard Space Flight Center*

The Applied Sciences Program later selected additional proposals for one-year awards from a Congressionally-directed augmentation, including one project for the Invasive Species portfolio (in conjunction with the Ecological Forecasting program):

> Integration of a Large-area Invasive Spread Network (LISN) into the NISFS for Ecological Forecasting
> *PI: Robert Crabtree, Yellowstone Ecological Research Center*

ROSES 2005 – Section A.24

For the Applied Sciences portion of the ROSES 2005 NRA, the Invasive Species program element received 8 Step-1 proposals and encouraged 5 to submit full proposals. The Step-2 proposals were due in November 2005 with selections expected by April 2006.

PUBLICATIONS (SELECTED)

Watson, F., *et al*. "Testing a Distributed Snowpack Simulation Model against Diverse Observations," submitted to the *Journal of Hydrology*.

Watson, F., *et al.* "Optimal Sampling Schemes for Estimating Mean Snow Water Equivalents in Stratified Heterogeneous Landscapes," submitted to the *Journal of Hydrology*.

Garrott, R., *et al.* "Using Snow to Map Earth's Heat from Space," submitted to *Remote Sensing of Environment*.

Bergman, E., *et al*. "Assessment of Prey Vulnerability through Analysis of Wolf Movements and Kill Sites" *Ecological Applications*, in press.

Watson, F., *et al*. "Temporal Variability in Winter Travel Patterns of Yellowstone Bison: the Effects of Road Grooming," submitted to *Ecological Applications*.

Morisette, J., *et al*. "A Tamarisk Habitat Niche Map for the Continental USA," *Frontiers in Ecology and the Environment*, in press.

Stohlgren, T., *et al*. "Risk Analysis for Biological Hazards: What We Need to Know about Invasive Species," *Risk Analysis*, in press.

Schnase, J., *et al*. "Invasive Species: An Emerging Science Application for Geospatial Information," keynote paper, Agouris and Croitoru (eds), *Next Generation Geospatial Information*.

Cushing, J., *et al*. "Eco-informatics and natural resource management," Raschid and Ludaescher (eds), *Proceedings of the 2nd International Workshop on Data Integration and Life Sciences*.

Morisette, J., *et al*. "A Tamarisk Habitat Suitability Map for the Continental U.S.," *Frontiers in Ecology*, in press.

CONFERENCE/WORKSHOP PRESENTATIONS (SELECTED)

Watson, F., "Systems Integration and Visualization of Yellowstone," *NASA Biodiversity and Ecological Forecasting Team Meeting*, Washington, DC.

Morisette, J., "Value Added Products from EOS," *NASA Biodiversity and Ecological Forecasting Team Meeting*, Washington, DC.

Morisette, J., "The Invasive Species Forecasting System," *Joint Workshop on Ecological Modeling for Applied Sciences*, Monterey, CA.

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